



(11) **EP 2 606 737 B2**

(12) **NEW EUROPEAN PATENT SPECIFICATION**
After opposition procedure

(45) Date of publication and mention
of the opposition decision:
21.11.2018 Bulletin 2018/47

(51) Int Cl.:
A22C 21/00 (2006.01)

(45) Mention of the grant of the patent:
01.04.2015 Bulletin 2015/14

(21) Application number: **12192917.8**

(22) Date of filing: **16.11.2012**

(54) **Device for processing a carcass part of slaughtered poultry**

Vorrichtung zur Verarbeitung von Körperteilen geschlachteten Geflügels

Dispositif de traitement d'une pièce de carcasse de volaille abattue

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **22.12.2011 NL 2008021**

(43) Date of publication of application:
26.06.2013 Bulletin 2013/26

(73) Proprietor: **Meyn Food Processing Technology
B.V.
1511 MA Oostzaan (NL)**

(72) Inventors:
• **De Vos, Ferdinand Allard
1511 MA Oostzaan (NL)**

• **Vonk, Pieter Willem
1511 MA Oostzaan (NL)**

(74) Representative: **Van Breda, Jacobus
Octrooibureau Los & Stigter B.V.
Weteringschans 96
1017 XS Amsterdam (NL)**

(56) References cited:
**EP-A1- 1 430 780 EP-A2- 1 454 531
EP-A2- 2 289 340 WO-A2-2011/068402
WO-A2-2011/068402 US-A- 5 088 957
US-B2- 7 063 611**

EP 2 606 737 B2

Description

[0001] The invention relates to a device for processing a carcass-part of slaughtered poultry in a processing line, which carcass-part is supported on a carrier that is movable in said processing line and comprises wing-joints, coracoids, a wishbone embodied with two legs that merge into each other at an acute angle, a keelbone, at least one membrana and/or ligament that connects at least to the wishbone, and naturally present meat including inner and outer fillets. The device comprises means for cutting the membrana and/or removing of said wishbone from the carcass-part, which means comprise an arrow-shaped knife and two blades arranged on opposite sides of said knife. The blades are independently movable with respect to the knife and are arranged with forward edges for cutting.

[0002] Such a device is known from EP-A-2 289 340 but differentiates from EP-A-1 454 531, both in the name of the applicant. In EP-A-1 454 531 a gouging member is used together with a shearing blade to twist the wishbone out of the shoulder joints of a carcass part. In the known method of EP-A-2 289 340 the wishbone is first disconnected from a first membrana and/or ligament with which it attaches to the remainder of the carcass by introducing said means for cutting the membrana and/or removing of the wishbone into the carcass for cutting a first membrana and/or ligament. Thereafter said means are operated for cutting the legs of the wishbone, and for penetrating and/or cutting a further membrana that connects the wishbone to the keelbone

[0003] The document WO 2011/068402 discloses a device containing all the features of the preamble of claim 1.

[0004] The instant invention is aimed at improving the practical results that are achieved with the known device.

[0005] It is a further objective of the invention to reduce the risk of bone splinters remaining in the meat of the poultry after removal of the wishbone.

[0006] It is still a further objective of the invention to increase the yield of meat of the slaughtered poultry.

[0007] It is a further object of the invention to reduce the risk of damaging the fillets in the process of removing the wishbone.

[0008] Still a further objective is to alleviate the process of inserting the knife with blades into the carcass part.

[0009] Still a further objective is to reduce manufacturing costs of the device of the invention, and to reduce the level of its tuning requirements.

[0010] These and other objectives and advantages are at least in part achieved with the device in accordance with claim 1.

[0011] According to a preferred embodiment of the invention at least one of the blades and the arrow shaped knife is provided with first portions following the arrow's point and the blades' forward edges that precede second portions of said knife and blades that are positioned at a side facing away of the arrow's point and the blades' forward edges, wherein the first portions are without arrow shape and narrower than the second portions for accommodating the wishbone legs adjacent to said first portions. With this measure the risk of bone splinters or unintentionally breaking the wishbone legs prior to their removal from the carcass part, is reduced. It also reduces the risk of damaging the fillets when introducing the knife into the carcass part. The narrower front portions also alleviate the process of introducing the knives and blades into the carcass part. This is beneficial because the carcass part better maintains its position on the carrier that supports the carcass part and consequently reduces the tuning requirements of the knife and blades.

[0012] Preferably the device is arranged to move the arrow shaped knife and the two blades on opposite sides of said knife in a unitary movement from within the carcass-part in a direction farther away from a longitudinal body axis of the carcass part so as to move the wishbone legs while they are still connected to the wing joints until they will completely detach from the wing joints of the carcass-part. This measure both further reduces the risk of bone splinters and optimizes the yield of meat since the known cutting of the wishbone legs inevitably would bring about partially cutting of the meat, which is now also avoided. Moreover since according to the invention the wishbone can be removed integral from the carcass part, this also improves the yield of meat. Further the arrow shaped knife can be embodied simpler, without the cutting side-edges which in the known device are required for cutting the wishbone legs. This makes the knife easier to manufacture.

[0013] Preferably the arrow shaped knife is provided with swivable hooks having a first position in which the hooks are at an acute angle with the outer boundaries of the knife to reduce resistance when the knife is moved into the carcass part, and a second position in which the hooks are extending sideways pointing away from the knife in a direction transverse to a longitudinal axis of said knife to enable that the hooks contact the wishbone legs when removing the knife from the carcass part. This measure makes possible that after the means for cutting the membrana and/or removing of said wishbone are introduced into the carcass part, the arrow shaped knife and the two blades can be simply moved upwards causing the hooks to extend transversely sideways with respect to the longitudinal axis of the knife. The hooks then operate on the wishbone legs causing their eventual disconnection from the wing joints.

[0014] The invention will hereinafter be further elucidated with reference to the drawing showing figures of some exemplary embodiments of the device and method of the invention that are not restrictive with respect to the appended claims.

[0015] In the drawing:

- figure 1 schematically shows the bones of a carcass-part of slaughtered poultry;
- figure 2 shows a detailed view of the device of the

- prior art pertaining to its knife and the two blades arranged on opposite sides of said knife;
- figure 3 shows a side view on the left and a frontal view on the right of the arrow shaped knife of the prior art;
 - figure 4A/4B show a side view on the left and a frontal view on the right of a first embodiment (fig. 4A) and a second embodiment (fig. 4B) of the arrow shaped knife of the invention;
 - figure 5 shows a side view of a blade according to the prior art to be used in combination with an arrow shaped knife;
 - figure 6 shows a side view of the blade according to the invention to be used in combination with an (arrow shaped) knife;
 - figure 7 shows for reference purposes a side view of a carcass part to be processed in accordance with the invention;
 - figure 8 shows schematically the step of moving the arrow shaped knife with the side blades into the carcass part;
 - figure 9 shows schematically the step of moving the arrow shaped knife with the side blades in unison away from the carcass part;
 - figures 10 and 11 show schematically step of moving the arrow shaped knife with the side blades in unison upwards;
 - figure 12 shows schematically the step of moving the arrow shaped knife with the side plates in unison downwards;
 - figures 13 and 14 provide a frontal view of the operation of the arrow shaped knife of the invention provided with swivable and sideways extendable hooks; and
 - figures 15 and 16 provide a frontal view of the operation of the side blades of the invention provided with swivable and sideways extendable hooks.

[0016] Whenever in the figures the same reference numerals are applied, these numerals refer to the same parts.

[0017] Taking first reference to figure 1 the bone structure of a carcass-part 1 is shown. Apart from the (not shown) meat that naturally is present, the carcass-part 1 has ribs 2 connected to the vertebral column 3. At the breast side the carcass-part 1 is provided with the breastbone crest 4 and the breastbone plate 5. Together they are referred to as the breastbone or keelbone 6. Further figure 1 shows that the carcass-part 1 is provided with the shoulder blade or scapula 10, and that there are wing-joints 8 on one side connected to the coracoids 7, and at the other side connected to the wishbone 9 having legs 9' and 9" that merge into each other at the point provided with reference 11.

[0018] The device of the invention is arranged for processing a carcass-part 1 of slaughtered poultry in a processing line, whereby the carcass-part 1 is supported on a carrier that moves in the processing line. Such an

arrangement is known for decades from daily practice in the poultry industry, so that the showing thereof in the drawing can be dispensed with. Any person with ordinary skill in the art is knowledgeable with the arrangement of carriers that move in a processing line for the purpose of processing carcass-parts that are supported by such carriers through the processing line, whilst said carcass-parts are being processed by devices arranged in or next to the processing line.

[0019] Taking reference now to figure 2 a detailed view is offered to knife 12 according to the prior art, clearly showing its arrow shape with an arrow point 14. Further figure 2 shows that two blades 15, 16 are arranged on opposite sides of the knife 12. The blades 15, 16 are preferably arranged to be independently movable with respect to the knife 12, and are provided with forward edges 17, 18 that are intended for cutting any membrana and/or ligament that connects to the wishbone, in particular the membrana that connects the wishbone to the keelbone in order to enable completely releasing the wishbone 9 from the remainder of the carcass-part 1.

[0020] With reference to figure 3 a detail view is provided of the arrow shaped knife 12 of the prior art. On the left it can be seen that the knife 12 has an S-shaped contour; on the right it can be seen that the knife 12 has a first portion A following the arrow's point 14 that preceeds a second portion B of said knife 12 that is positioned at a side facing away of the arrow's point 14, wherein the first portion A is broader than the second portion B.

[0021] Conversely figures 4A and 4B show two embodiments of the arrow shaped knife 12 of the invention which differentiates from the prior art knife in that the knife 12 has a first portion A following the arrow's point 14 that preceeds a second portion B of said knife 12 that is positioned at a side facing away of the arrow's point 14, wherein the first portion A is narrower than the second portion B for accommodating the wishbone legs adjacent to said first portions A. The second portion B can assist the removal of the wishbone from the wing joints by pushing the wishbone legs at the time the knife 12 is jointly moved with the blades for twisting the wishbone loose from the wing joints.

[0022] With reference to figure 5 a blade 15 of the prior art is shown that is provided with a first portion C following the blades' forward edge 17 that preceeds a second portion D of said blade 15 that is positioned at a side facing away of the blades' forward edge 17, wherein the first portion C has the same width as the second portion D.

[0023] Conversely figures 6 shows a blade 15 of the invention that is provided with a first portion C following the blades' forward edge 17 that preceeds a second portion D of said blade 15 that is positioned at a side facing away of the blades' forward edge 17, wherein the first portion C is narrower than the second portion D for accommodating the wishbone legs adjacent to said first portion C. This applies in particular when the blades 15 together with the knife 12 are moved transversely to the

longitudinal body axis of the carcass part in order to twist the wishbone for its removal from the wing joints.

[0024] For reference purposes figure 7 shows the carcass part 1 in a side view, wherein the wing joints 8, and the wishbone 9 with the wishbone legs 9', 9" are separately indicated.

[0025] Figure 8 shows a first step in the process of the invention for removing the wishbone 9 integrally from the carcass part 1, by which first step the arrow shaped knife 12 and the two blades 15, 16 arranged on opposite sides of said knife 12 are moved according to arrow E into the carcass part 1 for cutting the membrana and/or ligament that connects the wishbone 9 to the keelbone 6.

[0026] Figure 9 shows a first embodiment of the method of the invention in which the arrow shaped knife 12 and the two blades 15, 16 are moved away from a longitudinal axis of the carcass part to turn the wishbone legs 9', 9" with reference to the wing joints 8 to which they are still connected. Subsequently by further turning the wishbone legs 9', 9" they are dislocated out of the wing joints 8 of the carcass-part 1. In this embodiment the arrow shaped knife 12 and the two blades 15, 16 on opposite sides of said knife 12 are moved first in a unitary movement from within the carcass-part 1 in a sideways direction according to arrow F away from (a longitudinal axis of) the carcass part 1. Following this movement the arrow shaped knife 12 and the side blades 15, 16 can be moved upwards in unison according to arrows G (figure 10) and H (figure 11) in the process of which the wishbone legs 9', 9" are completely turned out of the wing joints 8 to enable their complete and integral detachment from the carcass part 1.

[0027] Figure 12 concerns a variation to the method of the invention as explained with reference to figures 9, 10 and 11, in which prior to the upward movement of the arrow shaped knife 12 and the two side blades 15, 16, but following their unitary movement away from the carcass part 1 as shown in figure 9, the knife 12 and blades 15, 16 are first moved downwardly in unison according to arrow I in order to effect the detachment of the wishbone legs 9', 9" from the wing joints 8.

[0028] Figures 13 and 14 show a second embodiment of the method of the invention in which the arrow shaped knife 12 is moved to lift the wishbone legs 9', 9" while they are still connected to the wing joints 8, and subsequently turn the wishbone legs 9', 9" out of the wing joints 8 of the carcass-part 1.

[0029] Figure 13 shows that the arrow shaped knife 12 is provided with swivable hooks 22, 23 having a first position in which the hooks 22, 23 are at an acute angle with the outer boundaries of the knife 12 to reduce resistance when the knife 12 is moved into the carcass part 1. The swivable hooks 22, 23 are moved in their first position as symbolized by the arrows J by the carcass part 1, and the hooks are therefore product controlled. Figure 14 shows that the hooks 22, 23 have a second position in which the hooks are extending sideways pointing away from the knife 12 in a direction transverse to a

longitudinal axis of said knife 12. Also the movement of the hooks 22, 23 to the second position as symbolized by the arrows K is product controlled and caused by the relative movement of the knife 12 with respect to the carcass part 1. The second position of the hooks 22, 23 enables that the hooks contact the wishbone legs 9', 9" and move into the angle of the legs 9', 9" with the wishbone joints 8 when removing the knife 12 from the carcass part 1 as shown in figure 14. Due to the fact that the wishbone legs 9', 9" are still connected to the wishbone joints 8, this will eventually result in removal of the wishbone legs 9', 9" from the wishbone joints 8.

[0030] Figures 15 and 16 show a third embodiment of the method of the invention in which the blades 15, 16 on opposite sides of the arrow shaped knife 12 are moved to turn the wishbone legs 9', 9" while they are still connected to the wing joints 8, resulting eventually in the complete disconnection of the wishbone legs 9', 9" from the wing joints 8 of the carcass-part 1.

[0031] Figure 15 shows that the blades 15, 16 are provided with swivable hooks 24, 25 having a first position in which the hooks 24, 25 are at an acute angle with the blades 15, 16 to reduce resistance when the blades 15, 16 are moved into the carcass part 1. Also in this embodiment the swivable hooks 24, 25 are moved in their first position by the carcass part 1, and the hooks are therefore again product controlled. Figure 14 shows that the hooks 24, 25 have a second position in which the hooks are extending sideways pointing away from the blades 15, 16 in a direction transverse to the longitudinal axes of said blades 15, 16. Also this second position is product controlled and caused by the relative movement of the blades 15, 16 with respect to the carcass part 1. The second position of the hooks 24, 25 enables that the hooks contact the wishbone legs 9', 9" and move into the angle of the legs 9', 9" with the wishbone joints 8 when removing the blades 15, 16 from the carcass part 1 as shown in figure 16. Due to the fact that the wishbone legs 9', 9" are still connected to the wishbone joints 8, also in this embodiment this will result in their complete removal from the wishbone joints 8.

[0032] It will be clear for the person skilled in the art that there are numerous variations feasible to the method and device of the invention without departing from the appended claims. The above provided elucidation of the claims is therefore not to be considered as restricting the scope of protection that merits the invention, but merely to elucidate the appended claims.

Claims

1. Device for processing a carcass-part (1) of slaughtered poultry in a processing line, which carcass-part (1) is supported on a carrier that is movable in said processing line and comprises wing-joints (8), coracoids (7), a wishbone (9) embodied with two legs (9', 9") that merge into each other at an acute angle (11),

a keelbone (6), at least one membrana and/or ligament (13) that connects at least to the wishbone (9), and naturally present meat including inner and outer fillets, which device comprises means (12, 15, 16) for cutting the membrana and removing of said wishbone (9) from the carcass-part (1), embodied with an arrow-shaped knife (12) and two blades (15, 16) that are movably arranged on opposite sides of said knife (12), which blades (15, 16) are arranged with forward edges (17, 18) for cutting, **characterized in that** it is arranged to move the arrow shaped knife (12) and the two blades (15, 16) on opposite sides of said knife (12) in a unitary movement from within the carcass-part in a direction away from the carcass part so as to turn the wishbone legs (9', 9'') while they are still connected to the wing joints (8), and subsequently completely detach the wishbone legs (9', 9'') from the wing joints (8) of the carcass-part (1).

2. Device according to claim 1, **characterized in that** at least one of the blades (15, 16) and the arrow shaped knife (12) is provided with first portions following the arrow's point (14) and the blades' forward edges (17, 18) that precede second portions of said knife (12) and blades (15, 16) that are positioned at a side facing away of the arrow's point (14) and the blades' forward edges (17, 18), wherein the first portions (A) are without arrow shape and narrower than the second portions (B) for accommodating the wishbone legs (9', 9'') adjacent to said first portions (A).
3. Device according to claim 2, **characterized in that** after the arrow shaped knife (12) and the two blades (15, 16) are moved transversely away from the carcass part (1), said knife and blades are moved upwardly in unison for turning the wishbone legs (9', 9'') out of the wing joints (8) of the carcass-part (1).
4. Device according to claim 2 or 3, **characterized in that** after the arrow shaped knife (12) and the two blades (15, 16) are moved transversely away from a longitudinal body axis of the carcass part (1), and before said knife and blades are moved upwardly, the knife (12) and blades (15, 16) are first moved downwardly in unison for pulling the wishbone legs (9', 9'') out of the wing joints (8) of the carcass-part (1).

Patentansprüche

1. Vorrichtung zur Verarbeitung eines Körperteils (1) von geschlachtetem Geflügel in einer Fertigungslinie, wobei der Körperteil (1) auf einem Träger gestützt wird, der in der Fertigungslinie bewegbar ist, und umfasst: Flügelgelenke (8), Coracoide (7), ein Gabelbein (9), das mit zwei Schenkeln (9', 9'') verkörpert ist, die unter einem spitzen Winkel (11) in-

einander übergehen, einen Brustbeinkamm (6), mindestens eine Membran und/oder ein Ligament (13), die/das mindestens mit dem Gabelbein (9) verbunden ist/sind, und natürlich vorhandenes Fleisch, umfassend innere und äußere Filets, wobei die Vorrichtung Mittel (12, 15, 16) zum Schneiden der Membran und Entfernen des Gabelbeins (9) von dem Körperteil (1) umfasst, bereitgestellt mit einem pfeilförmigen Messer (12) und zwei Klingen (15, 16), die bewegbar auf gegenüberliegenden Seiten des Messers (12) angeordnet sind, wobei die Klingen (15, 16) mit vorderen Kanten (17, 18) zum Schneiden angeordnet sind, **dadurch gekennzeichnet, dass** diese eingerichtet ist, das pfeilförmige Messer (12) und die beiden Klingen (15, 16) auf gegenüberliegenden Seiten des Messers (12) in einer einheitlichen Bewegung von innerhalb des Körperteils in einer Richtung weg von dem Körperteil zu bewegen, um so die Gabelbeinschenkel (9', 9'') umzudrehen, während sie noch mit den Flügelgelenken (8) verbunden sind, und anschließend die Gabelbeinschenkel (9', 9'') vollständig von den Flügelgelenken (8) des Körperteils (1) zu lösen.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** mindestens eine der Klingen (15, 16) und das pfeilförmige Messer (12) mit ersten Abschnitten versehen sind, welche der Pfeilspitze (14) und den vorderen Kanten (17, 18) der Klingen folgen, und welche zweiten Abschnitten des Messers (12) und der Klingen (15, 16) vorangehen, die an einer Seite positioniert sind, welche von der Pfeilspitze (14) und den vorderen Kanten (17, 18) der Klingen abgewandt ist, wobei die ersten Abschnitte (A) keine Pfeilform aufweisen und schmaler sind als die zweiten Abschnitte (B), zum Aufnehmen der Gabelbeinschenkel (9', 9'') benachbart den ersten Abschnitten (A).
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass**, nachdem das pfeilförmige Messer (12) und die beiden Klingen (15, 16) in Querrichtung von dem Körperteil (1) weg bewegt werden, das Messer und die Klingen einheitlich nach oben bewegt werden, um die Gabelbeinschenkel (9', 9'') aus den Flügelgelenken (8) des Körperteils (1) zu drehen.
4. Vorrichtung nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass**, nachdem das pfeilförmige Messer (12) und die beiden Klingen (15, 16) in Querrichtung von einer Körperlängsachse des Körperteils (1) weg bewegt werden, und bevor das Messer und die Klingen nach oben bewegt werden, das Messer (12) und die Klingen (15, 16) zuerst einheitlich nach unten bewegt werden, um die Gabelbeinschenkel (9', 9'') aus den Flügelgelenken (8) des Körperteils (1) zu ziehen.

Revendications

1. Dispositif pour traiter une partie de carcasse (1) de volaille abattue dans une ligne de traitement, cette partie de carcasse (1) étant supportée sur un porteur qui est mobile dans ladite ligne de traitement et comprenant des articulations d'aile (8), des coracoïdes (7), une fourchette (9) constituée par deux branches (9', 9'') qui se rejoignent l'une dans l'autre selon un angle aigu (11), un bréchet (6), au moins une membrane et/ou un ligament (13) qui est relié(e) au moins à la fourchette (9), et de la viande naturellement présente, comprenant des filets intérieurs et extérieurs ; ce dispositif comprenant des moyens (12, 15, 16) pour couper les membranes et retirer ladite fourchette (9) de la partie de carcasse (1), constitués par un couteau en forme de flèche (12) et deux lames (15, 16) qui sont disposées de façon mobile sur des côtés opposés dudit couteau (12), ces lames (15, 16) étant agencées avec des bords avant (17, 18) pour la coupe, **caractérisé en ce qu'il** est agencé de façon à déplacer le couteau en forme de flèche (12) et les deux lames (15, 16) sur des côtés opposés dudit couteau (12) selon un mouvement unitaire à partir de l'intérieur de la partie de carcasse dans une direction s'éloignant à partir de la partie de carcasse de façon à tourner les branches (9', 9'') de la fourchette tandis qu'elles sont encore reliées aux articulations d'aile (8) puis à détacher ensuite complètement les branches (9', 9'') de la fourchette à partir des articulations d'aile (8) de la partie de carcasse (1).
2. Dispositif selon la revendication 1, **caractérisé en ce qu'**au moins l'une des lames (15, 16) et le couteau en forme de flèche (12) sont munis de premières parties suivant la pointe (14) de la flèche et les bords avant (17, 18) des lames qui précèdent des deuxièmes parties dudit couteau (12) et des lames (15, 16) qui sont positionnées en un côté dirigé de façon à s'éloigner de la pointe (14) de la flèche et des bords avant (17, 18) des lames, les premières parties (A) étant sans forme de flèche et étant plus étroites que les deuxièmes parties (B) pour recevoir les branches (9', 9'') de la fourchette adjacentes auxdites premières parties (A).
3. Dispositif selon la revendication 2, **caractérisé en ce que**, après que le couteau en forme de flèche (12) et les deux lames (15, 16) aient été éloignés transversalement de la partie de carcasse (1), ledit couteau et lesdites lames sont déplacés vers le haut à l'unisson pour tourner les branches (9', 9'') de la fourchette hors des articulations d'aile (8) de la partie de carcasse (1).
4. Dispositif selon la revendication 2 ou 3, **caractérisé en ce que**, après que le couteau en forme de flèche

(12) et les deux lames (15, 16) aient été éloignés transversalement d'un axe de corps longitudinal de la partie de carcasse (1), et, avant que ledit couteau et lesdites lames n'aient été déplacés vers le haut, le couteau (12) et les lames (15, 16) sont tout d'abord déplacés vers le bas à l'unisson pour tirer les branches (9', 9'') de la fourchette hors des articulations d'aile (8) de la partie de carcasse (1).

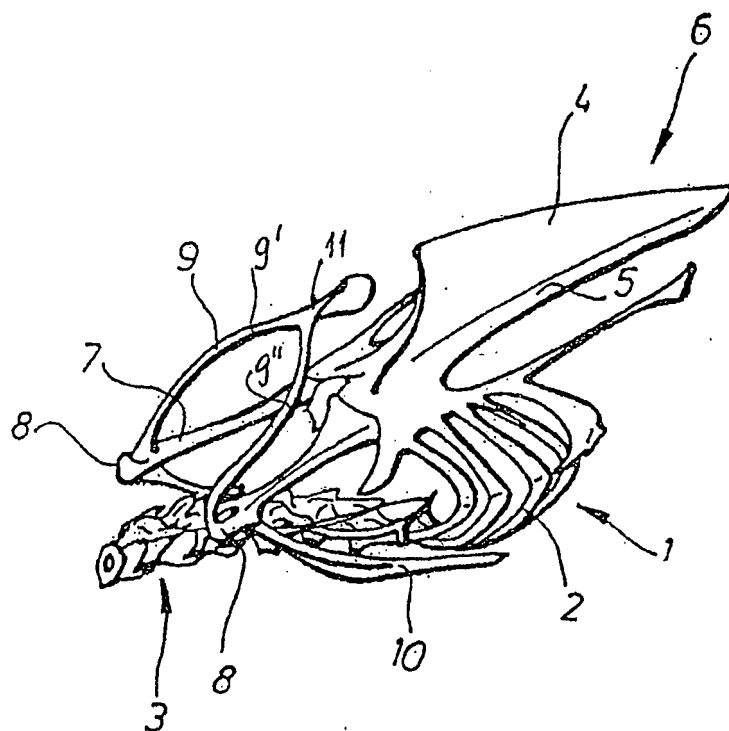


FIG. 1

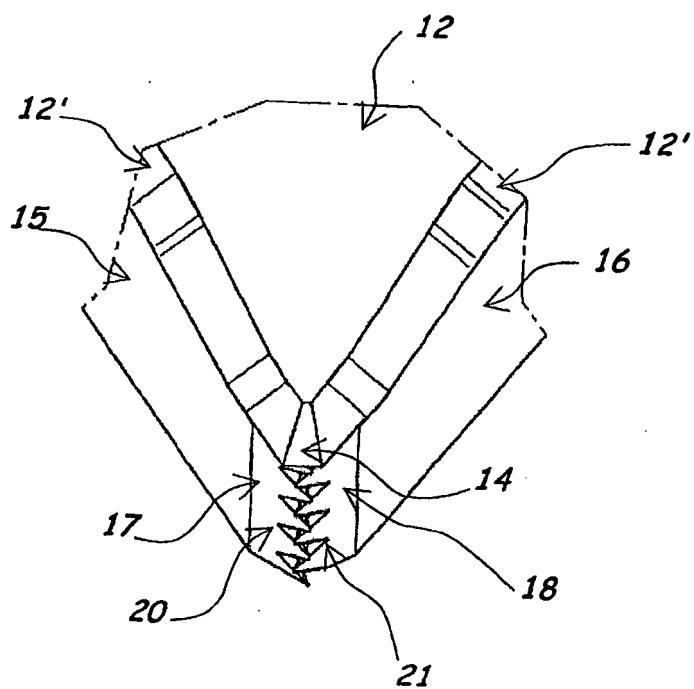


FIG. 2

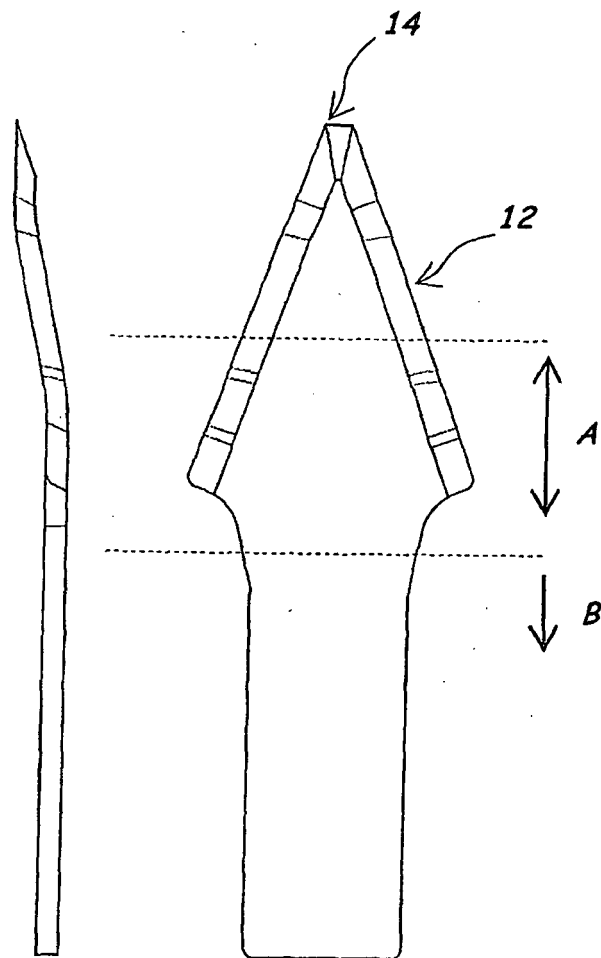


FIG. 3

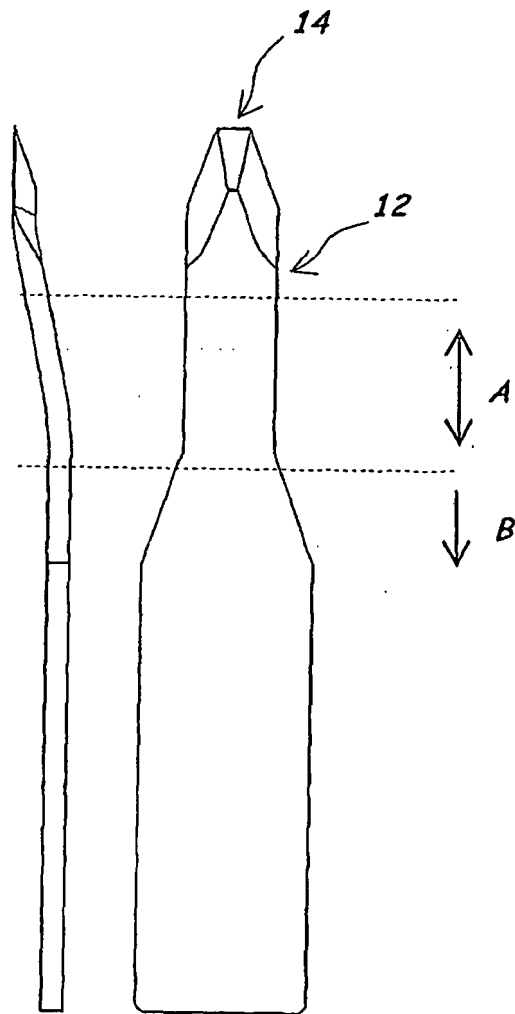


FIG. 4A

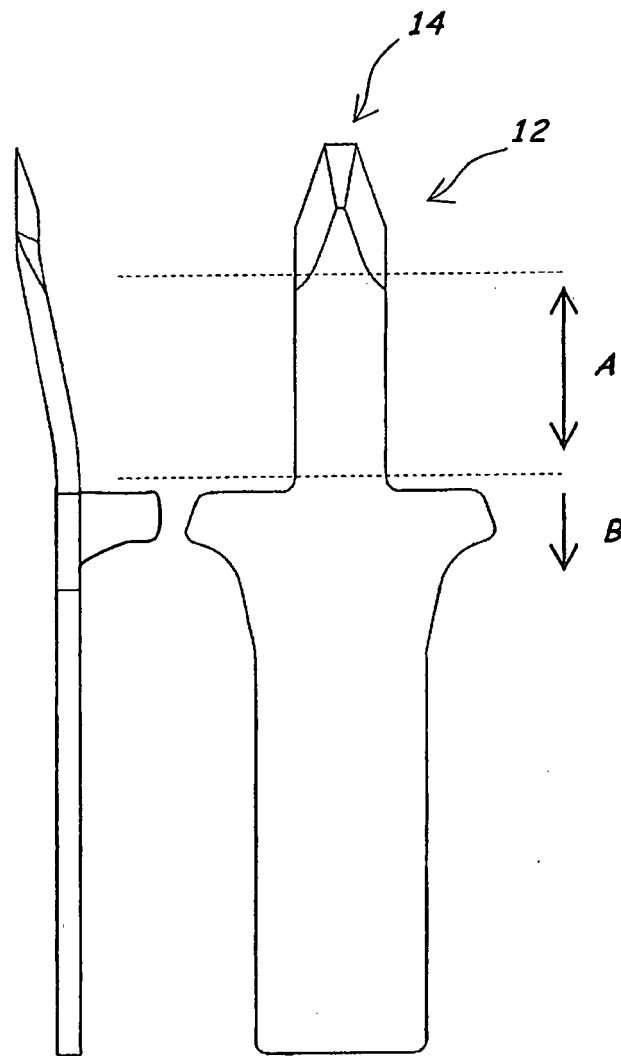


FIG. 4B

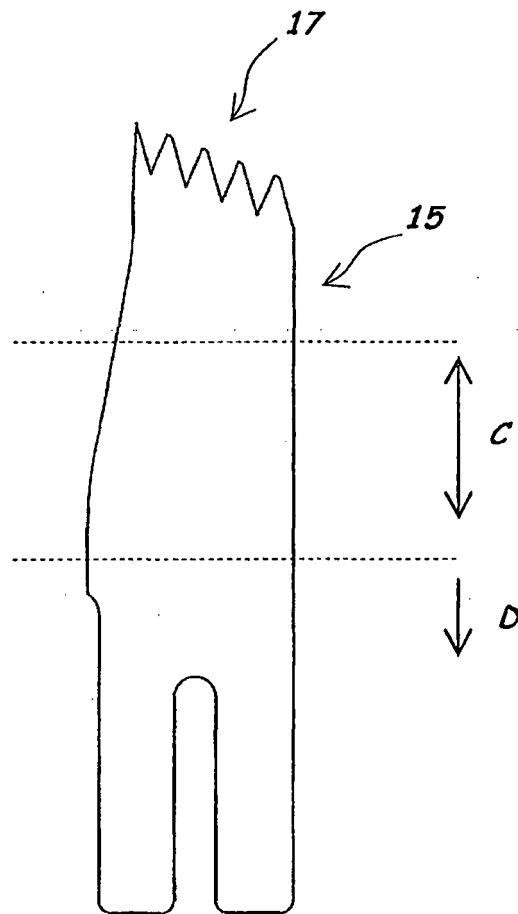


FIG. 5

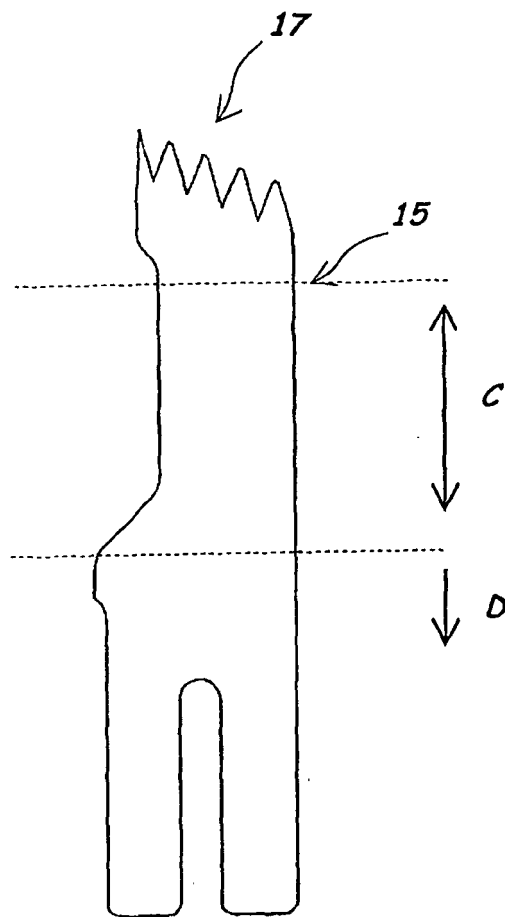


FIG. 6

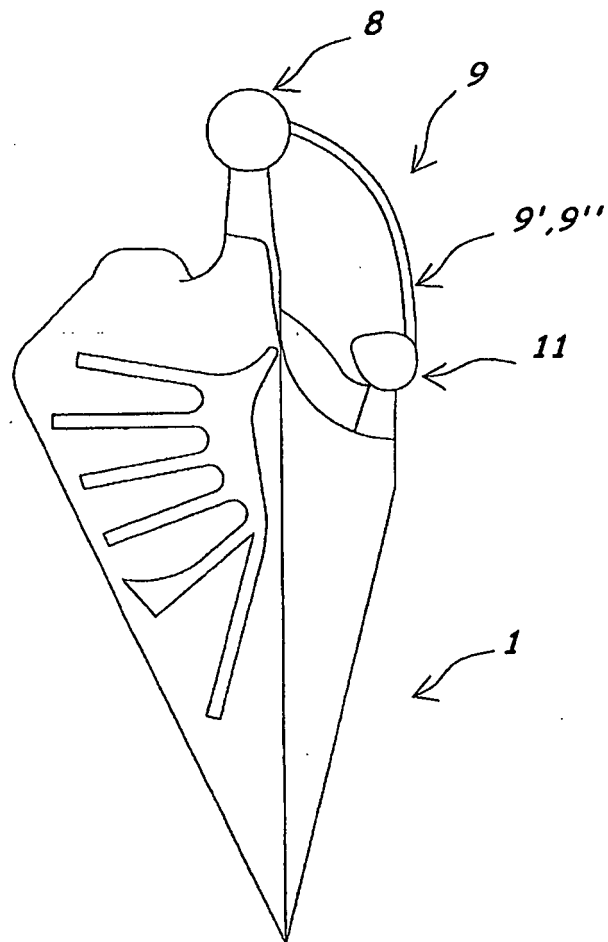


FIG. 7

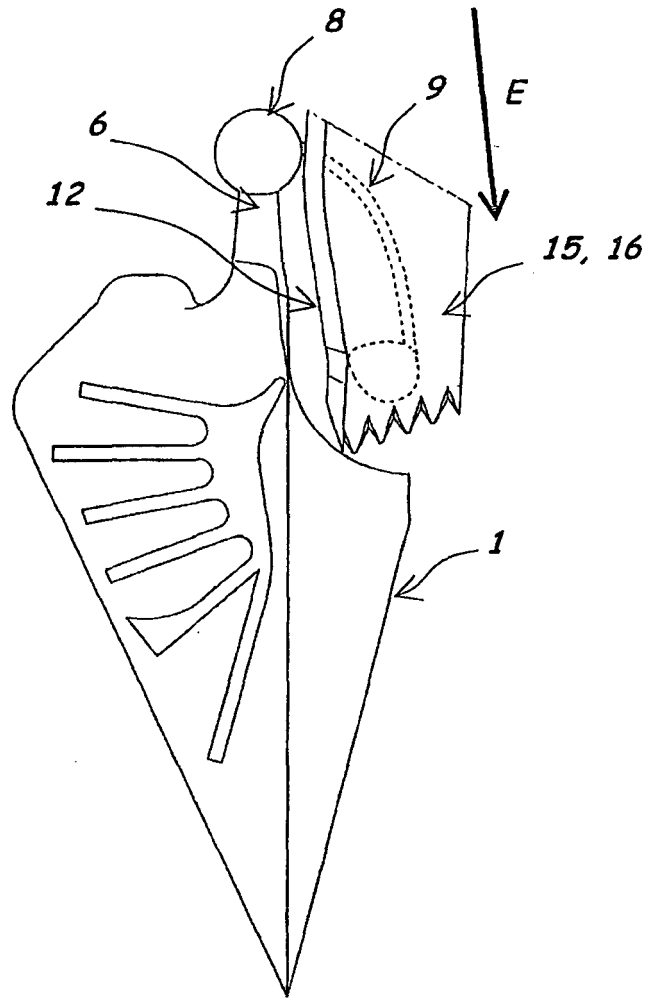


FIG. 8

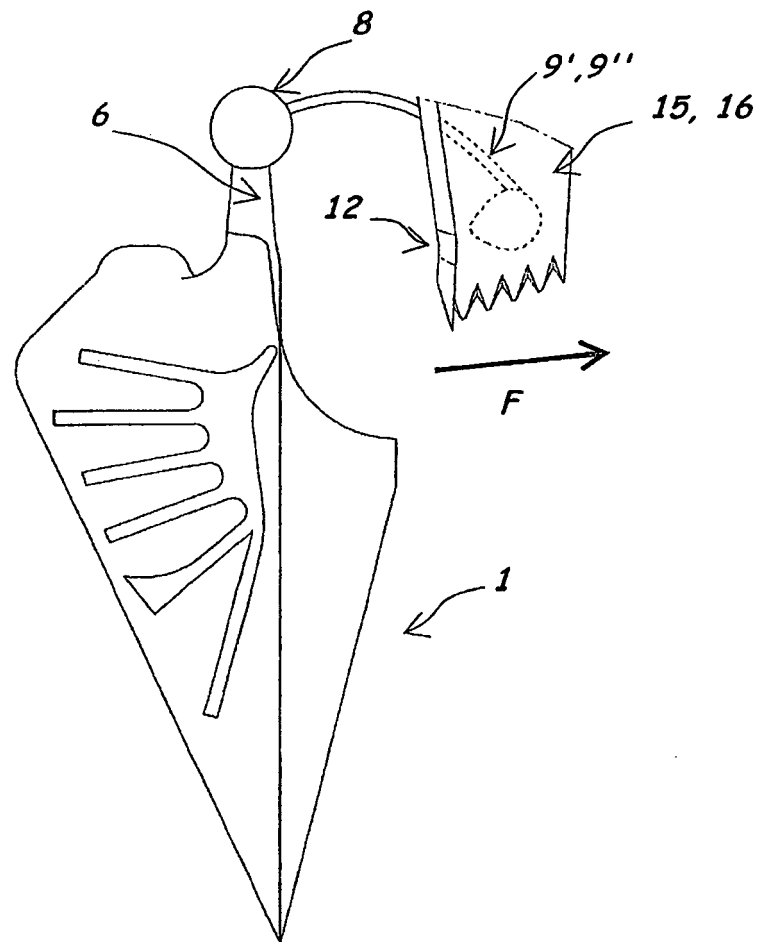


FIG. 9

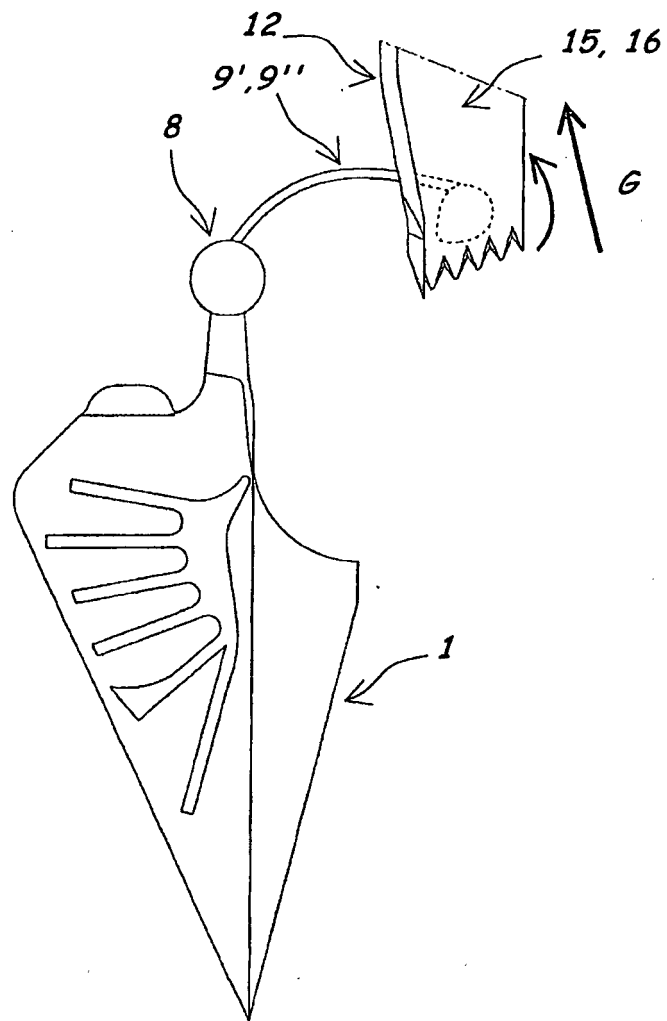


FIG. 10

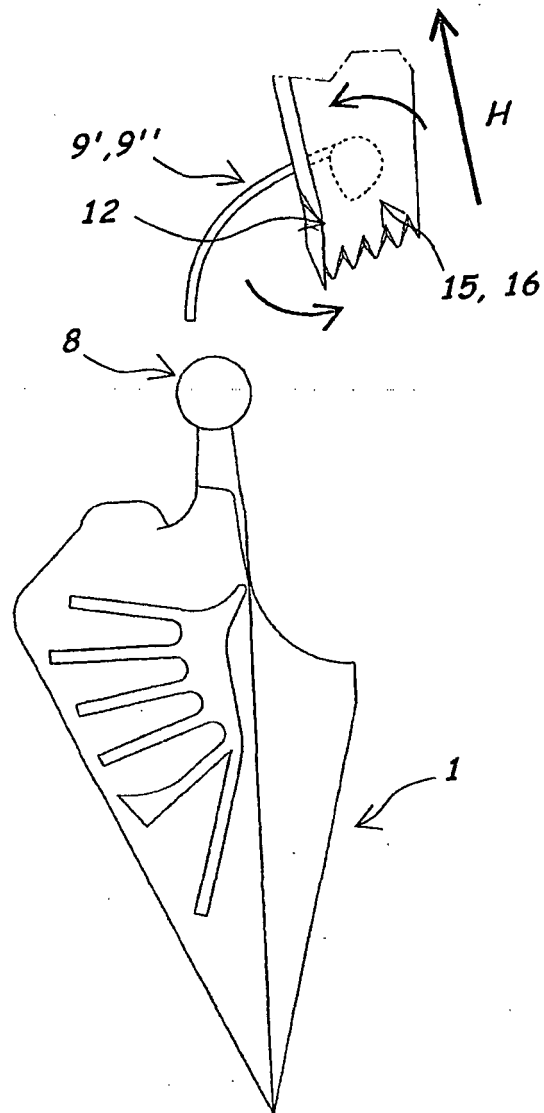


FIG. 11

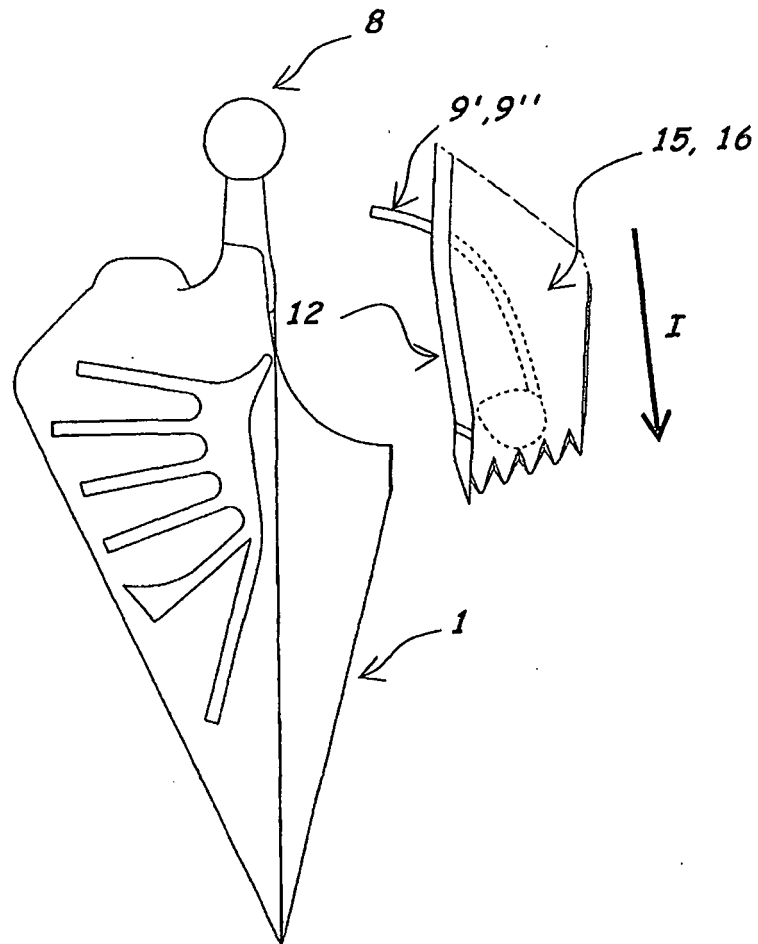


FIG. 12

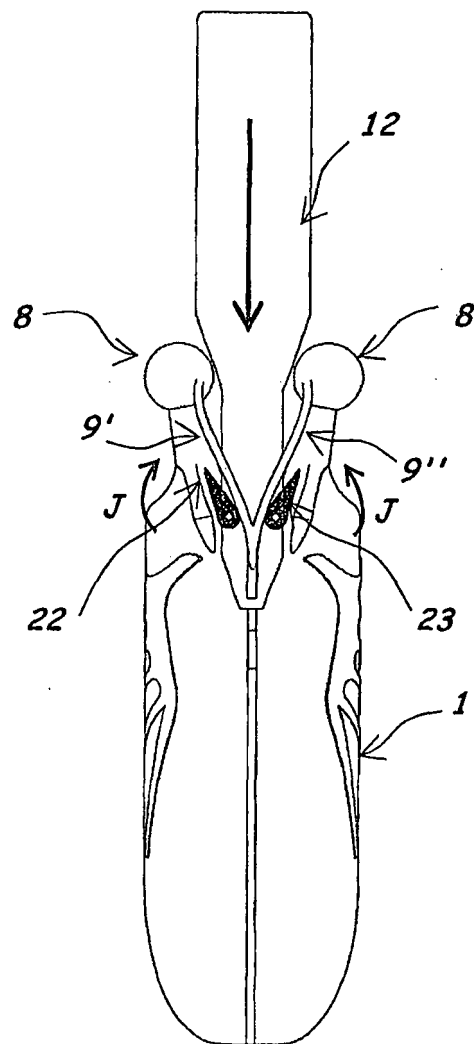


FIG. 13

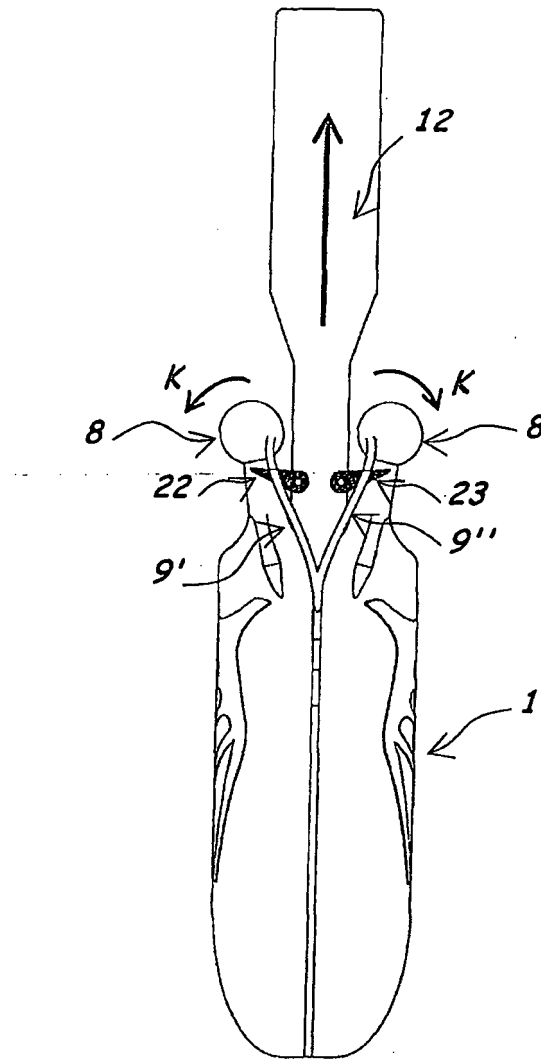


FIG. 14

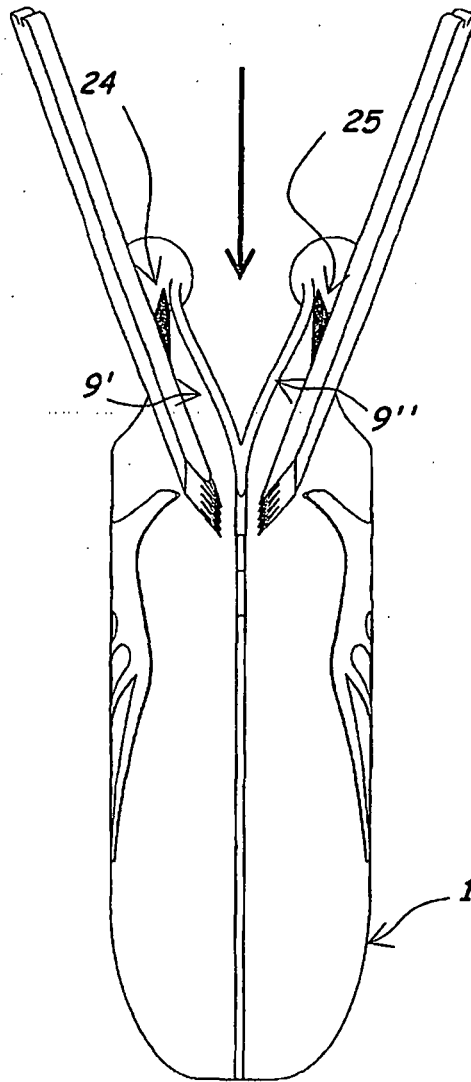


FIG. 15

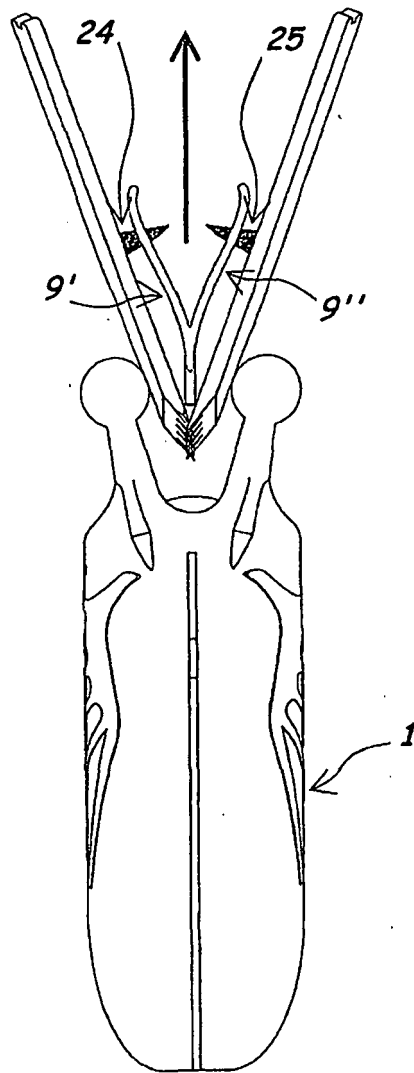


FIG. 16

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2289340 A [0002]
- EP 1454531 A [0002]
- WO 2011068402 A [0003]